ONTARIO MINISTRY OF ENVIRONMENT
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1970 OPERATING SUMMARY

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RICHMOND HILL

water pollution control plant

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ONTARIO WATER RESOURCES COMMISSION

Division of Plant Operations

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1970

Richmond Hill : water pollution
control plant.

81839

Water management in Ontario

Ontario
Water Resources
Commission

135 St. Clair Ave. W.
Toronto 195
Ontario

Once again we have the privilege of submitting to you our latest detailed report on financial progress and technical activity at your water pollution control plant.

The statistical information contained in this annual operating summary will undoubtedly be a useful barometer of efficiency. Of particular interest will be the comments and recommendations of the regional operations engineer, who was intimately connected with day-to-day operation throughout 1970.

Together with the extensive cost data provided, this information should assist greatly in your general understanding of the problems met and dealt with, and in furnishing a yardstick for possible future expansion.

D.S. Caverly,
General Manager.

D. McTavish

D.A. McTavish, P. Eng.,
Director,
Division of Plant Operations.

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RICHMOND HILL

water pollution control plant

operated for

THE TOWN OF RICHMOND HILL

by the

ONTARIO WATER RESOURCES COMMISSION

1970 ANNUAL OPERATING SUMMARY

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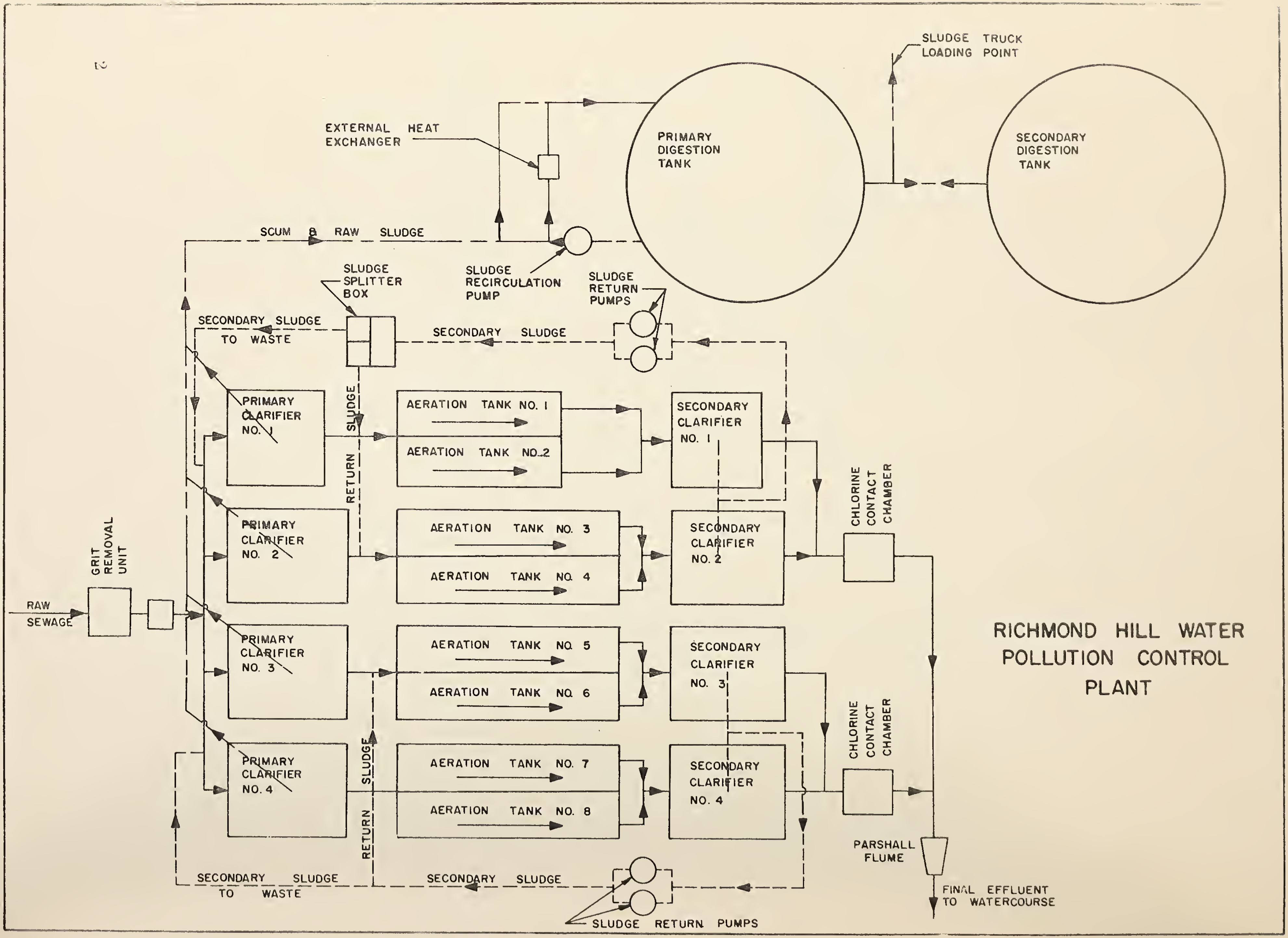


RICHMOND HILL WATER POLLUTION CONTROL PLANT

DESIGN DATA

PROJECT NO.	2-0006-57	TREATMENT	Activated Sludge
DESIGN FLOW	1.60 mgd	DESIGN POPULATION	16,000
BOD - Raw Sewage - Removal	200 mg/l 90%	SS - Raw Sewage - Removal	220 mg/l 95%

PRIMARY TREATMENT

Grit Removal

Type: Aerated
Size: One 15½' x 6' x 9' swd (5,220 gal)
Retention: 4.7 min

Primary Sedimentation

Type: Dorr
Size: One 16' dia x 10' swd
One 26' dia x 10' swd
Two 26' dia x 9.7' swd
(110,000 gal)
Retention: 1.65 hr
Loading: Surface, 908 gal/ft^2/day
Weir, 4880 gal/ft/day

SECONDARY TREATMENT

Aeration Tanks

Type: Diffused air; single-pass
Size: Two 58' x 9' x 9'
Two 81' x 14½' x 10¼'
Four 81' x 14½' x 9 1/3'
(482,700 gal)
Retention: 7.2 hr

Diffusers

- Carborundum diffusers

Air Supply

a) Type: Standaire (C.P.)
Size: One 400 scfm
Two 510 scfm

b) Type: Sutorbilt
Size: One 1,000 scfm

Secondary Sedimentation

Type: Dorr
Size: One 19' dia x 10' swd
One 30' dia x 10' swd
Two 30' dia x 9.7' swd
(147,180 gal)
Retention: 2.21 hr
Loading: Surface, 667 gal/ft^2/day
Weir, 4120 gal/ft/day

CHLORINATION

Type: W & T
Size: One 200 lb/day

Chlorine Contact Chamber

Size: Two 25' x 10' x 8' (25,000 gal)
Retention: 22½ min

OUTFALL

- to German Mills Creek

SLUDGE HANDLING

Digestion System – two-stage

Primary --
Type: Walker, 1 draft tube
Size: One 50' dia x 20' swd (39,200 ft^3 or 0.245 mil gal)

Secondary--
Type: Dorr (has one draft tube)
Size: One 30' dia x 19' swd (13,400 ft^3 or 83,500 gal)

'70 REVIEW

FLOWS	DAILY FLOW mil gal	OCCURRING IN THE MONTH OF	MONTHLY FLOW mil gal	OCCURRING IN THE MONTH OF
Average	2.25	—	68.5	—
High	2.47	December	79.7	March
Low	1.97	January	58.9	February

GENERAL

The Richmond Hill Water Pollution Control Plant is a secondary treatment plant with a design capacity of 1.6 mgd. The plant is operated by a staff of one chief operator and three operators. The average daily flow for the year was continuously above the design capacity, and flows up to 3.0 mgd were given secondary treatment.

The construction of the flow equalizing tank commenced during the latter part of the year and was expected to be ready for operation in the summer of 1971.

The digester was cleaned out and repairs were made however, leaking continued and more extensive repairs were required which will be completed in 1971.

EXPENDITURES

The cost of operating the plant increased to $78,533.04. The cost per million gallons treated was $95.48. The increase in cost was mainly due to the work on the digester.

PLANT FLOWS and CHLORINATION

A total of 822.5 million gallons was treated during the year. This represents an average daily flow for the year of 2.25 million gallons and is an increase of approximately 7 percent over the 1969 flow. The design flow of 1.6 million gallons per day was exceeded 100 percent of the time during the year.

Flows over the 3.0 mgd rate were bypassed and chlorinated. A total of 42,600 pounds of chlorine was used for an average dosage of 5.2 mg/l for the year.

PLANT EFFICIENCY

The raw sewage had an average concentration of 137 mg/l BOD and 177 mg/l suspended solids.

The final effluent had an average concentration of 13 mg/l BOD and 16 mg/l suspended solids compared to OWRC objectives of 15 mg/l for each. This represents an average reduction of 91% for BOD and suspended solids.

A total of 1166 cubic feet of grit was removed for an average of 1.42 cubic feet per million gallons treated. This amount of grit is considered normal.

AERATION

The primary effluent had an average concentration of 94 mg/l BOD and 136 mg/l suspended solids. The aeration section mixed liquor suspended solids had an average concentration of 1360 mg/l. The average loading on the aeration section was 34 pounds of BOD per 100 pounds of MLSS, for an F/M ratio of 0.34. An average of 2200 cubic feet of air was used per pound of BOD removed.

SLUDGE DIGESTION and DISPOSAL

A total of 17,330 cubic yards of raw sludge was removed from the primary tanks. The digester was cleaned out and repaired during the year. No digested sludge was hauled during the year.

CONCLUSIONS

The hydraulic load was above the design capacity and the organic load was near the design capacity. The average concentrations of 13 mg/l BOD and 16 mg/l suspended solids in the final effluent were near the OWRC objective of 15 mg/l, although at times they exceeded this objective.

Considering the loadings on the plant, it provided good treatment with an average reduction of 91% in BOD and suspended solids.

Flows which exceeded a 3.0 mgd rate were bypassed and chlorinated. The flow equalizing tank which is presently being constructed will accommodate fluctuations of flow and should result in less organic loading being directed to the receiving stream. It must however be emphasized that this tank will not correct the hydraulic overloading which exists at present under dry weather flow conditions, nor will the tank reduce loadings to the receiving stream to an acceptable level.

PROJECT COSTS

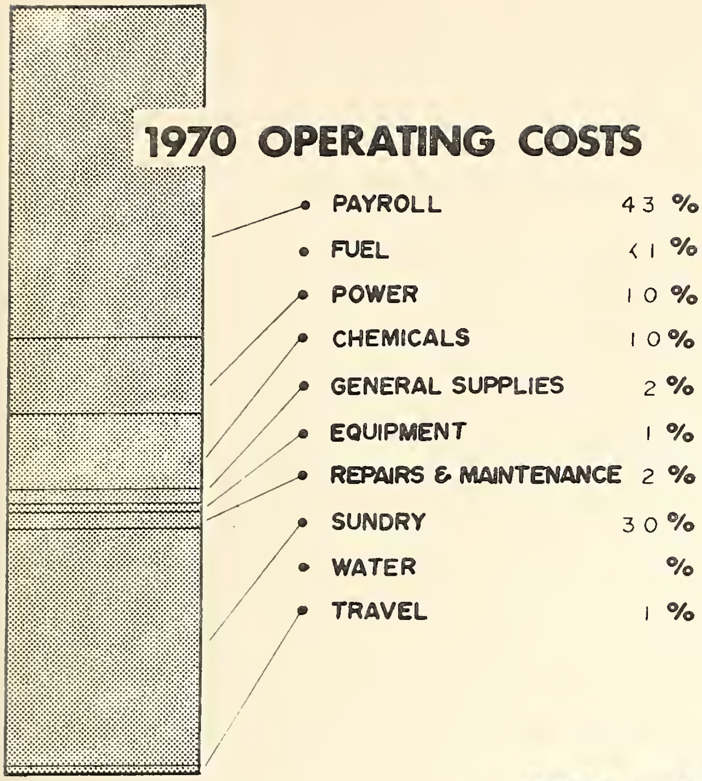
NET CAPITAL COST (Final)	$359,420.34
DEDUCT - Portion financed by CMHC/MDLB (Final)	-
Long Term Debt to OWRC	$359,420.34
Debt Retirement Balance at Credit (Sinking Fund) December 31, 1970	$123,467.56

Net Operating	$ 78,393.94
Debt Retirement	7,253.00
Reserve	1,990.68
Interest Charged	20,136.96
TOTAL	$107,774.58

RESERVE ACCOUNT

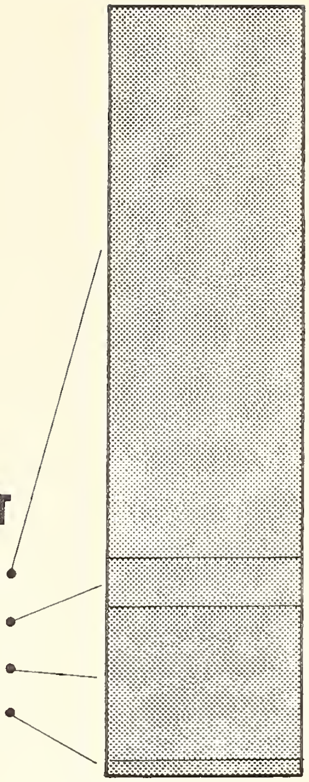
Balance @ January 1, 1970	$ 19,687.20
Deposited by Municipality	1,990.68
Interest Earned	1,318.66
	$ 22,996.54
Less Expenditures	-
Balance @ December 31, 1970	$ 22,996.54

1970 OPERATING COSTS



PAYROLL	43 %
FUEL	< 1 %
POWER	10 %
CHEMICALS	10 %
GENERAL SUPPLIES	2 %
EQUIPMENT	1 %
REPAIRS & MAINTENANCE	2 %
SUNDRY	30 %
WATER	%
TRAVEL	1 %

TOTAL ANNUAL COST



NET OPERATING	72 %
DEBT RETIREMENT	7 %
INTEREST	19 %
RESERVE FUND	2 %

Yearly Operating Costs

YEAR	MILLION GALLONS TREATED	TOTAL OPERATING COSTS	COST PER MILLION GAL	COST PER LB OF BOD REMOVED
1966	593.445	$51,339.00	$86.51	5 cents
1967	663.776	56,375.17	84.93	6 cents
1968	704.89	53.637.43	76.09	6 cents
1969	769.7	60,794.64	78.98	7 cents
1970	822.5	78,533.04	95.50	8 cents

MONTHLY OPERATING COSTS

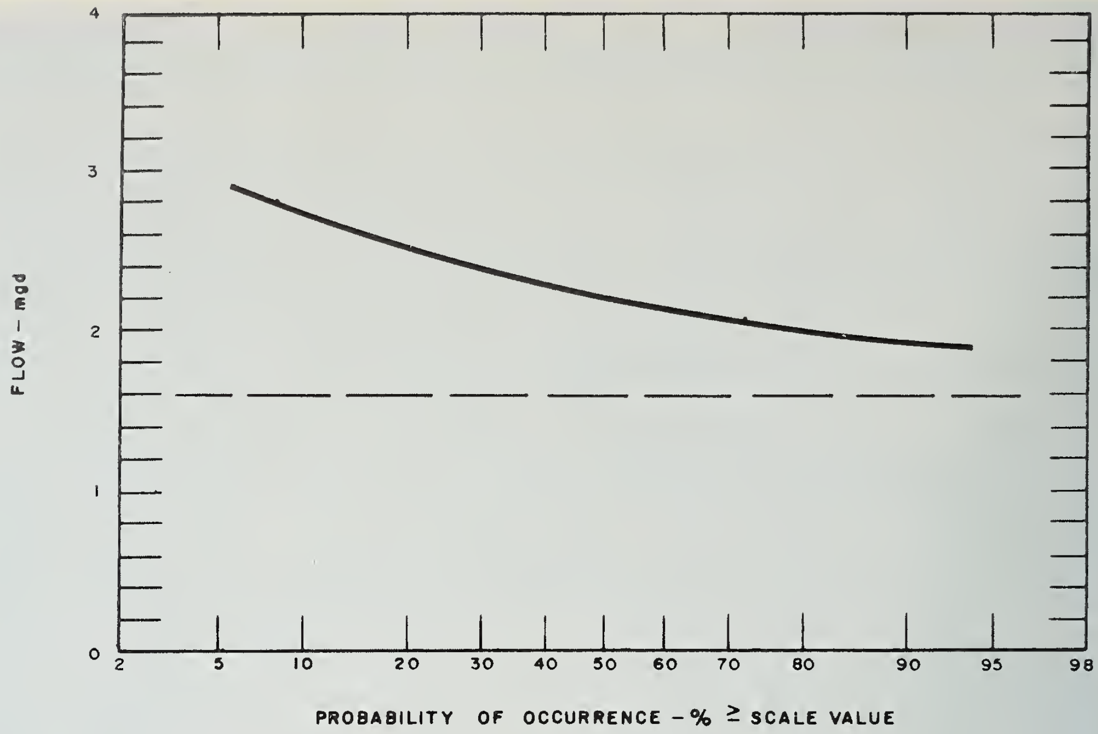
MONTH	TOTAL EXPENDITURE	PAYROLL	CASUAL PAYROLL	FUEL	POWER	CHEMICALS	GENERAL SUPPLIES	EQUIPMENT	REPAIRS and MAINTENANCE	SUNDRY *	WATER	TRAVEL
JAN	5937.87	3521.12	-	-	763.73	220.50	93.05	-	-	1339.47	-	-
FEB	5351.86	2466.89	-	178.43	696.55	441.00	80.10	-	47.01	1402.58	-	39.30
MAR	5426.84	2675.85	-	-	588.61	441.00	80.52	-	275.62	1336.44	-	28.80
APR	5156.41	2504.63	-	-	582.85	661.50	19.33	-	6.07	1302.98	-	79.05
MAY	5476.09	2762.40	-	-	605.19	581.18	285.12	-	132.63	1058.12	-	51.45
JUNE	3633.45	2539.29	139.10	-	633.06	40.32	49.56	-	129.00	68.77	-	34.35
JULY	7781.92	2482.03	219.47	34.68	683.60	1452.95	92.95	-	151.07	2610.12	-	55.05
AUG	7021.35	3747.50	511.82	-	661.46	319.66	163.44	-	183.74	1390.23	-	43.50
SEPT	6632.25	2618.12	29.31	5.78	632.99	887.39	255.03	-		2140.93	-	62.70
OCT	5325.89	2484.08	-	5.78	539.35	869.75	100.39	-	69.89	1219.45	-	37.20
NOV	5266.30	2794.42	-	8.53	683.57	887.65	51.49	-	(475.96)	1248.10	-	68.50
DEC	15522.81	2470.14	-	274.35	1398.07	1452.95	299.22	68.22	1148.61	8247.00	-	164.25
TOTAL	78533.04	33066.47	899.70	507.55	8469.03	8255.85	1570.20	68.22	1667.68	23364.19	-	664.15

BRACKETS INDICATE CREDIT

* SUNDRY INCLUDES SLUDGE HAULAGE COSTS WHICH WERE $16,804.92

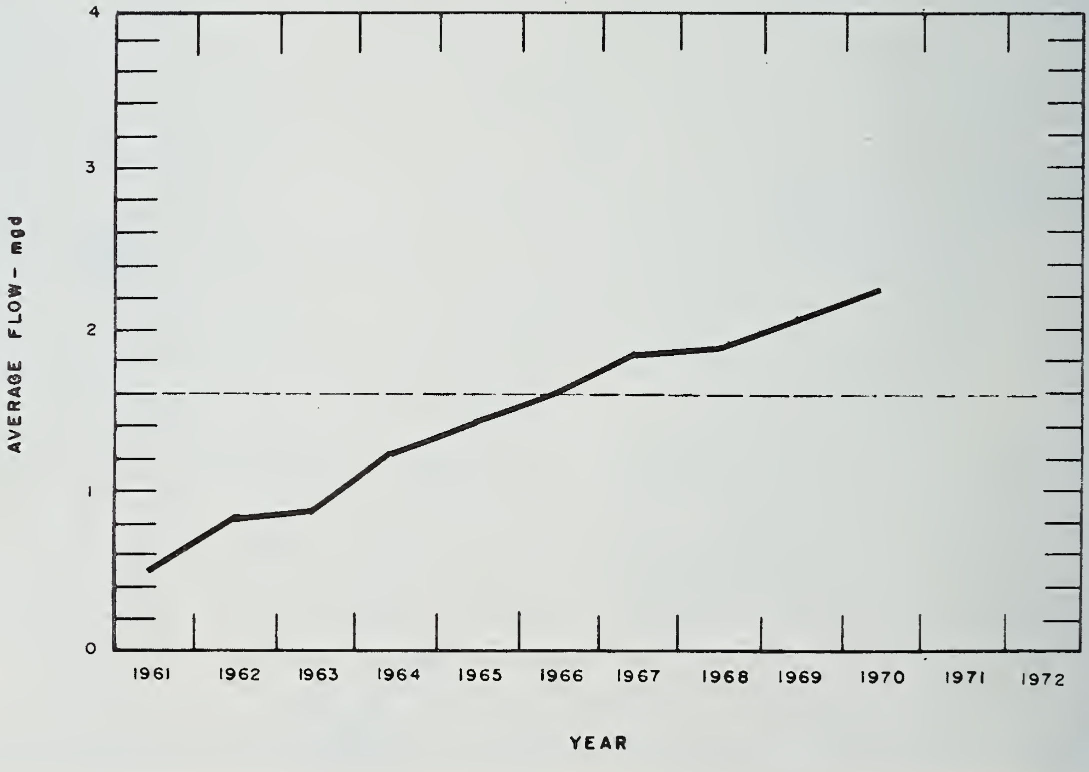
Note: Total does not include year-end adjustments.

PROCESS DATA



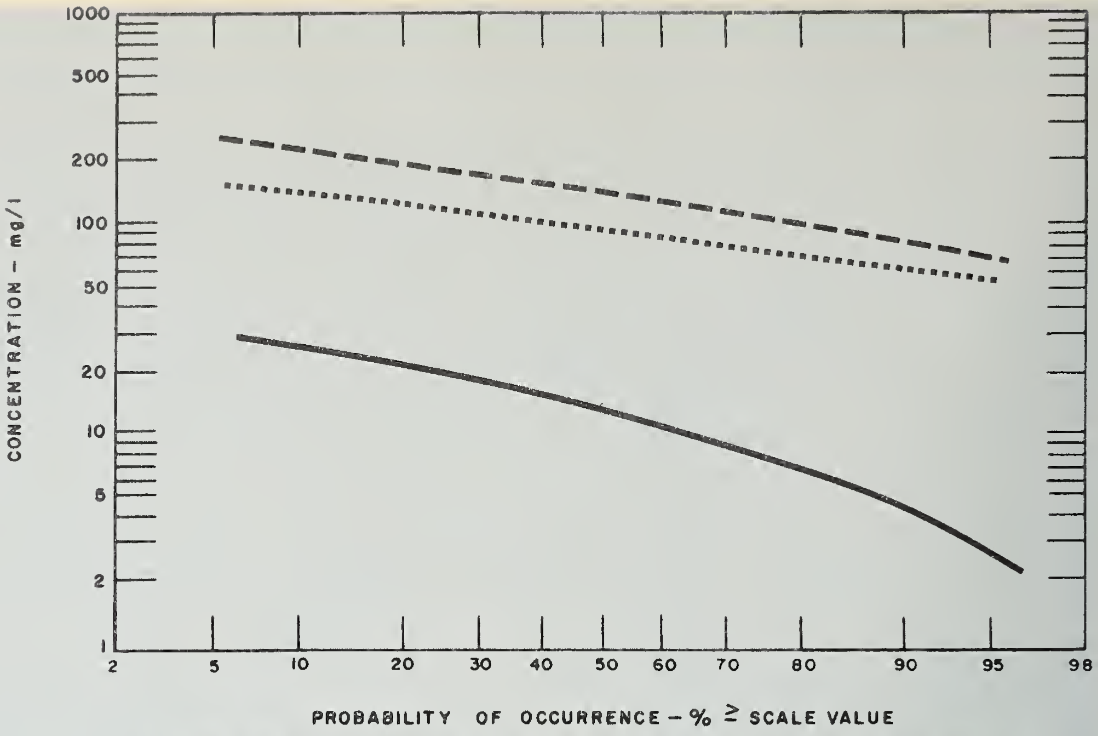
FLOWS

NOMINAL CAPACITY — — —



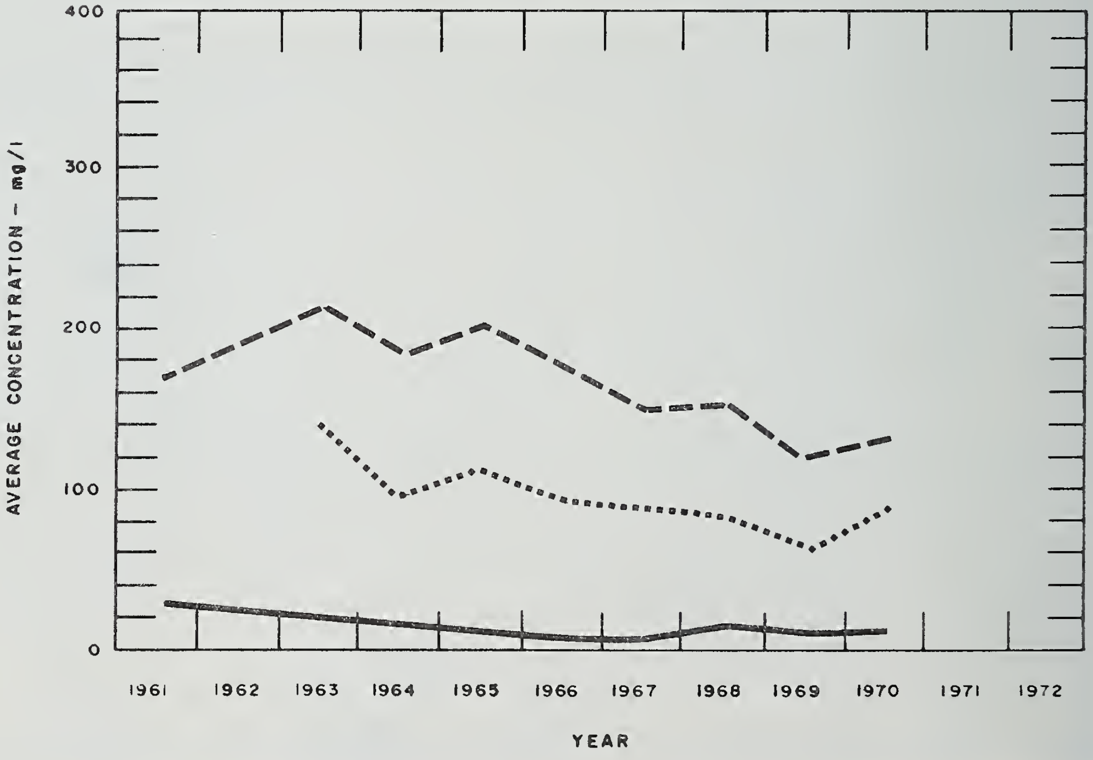
PLANT FLOWS and CHLORINATION

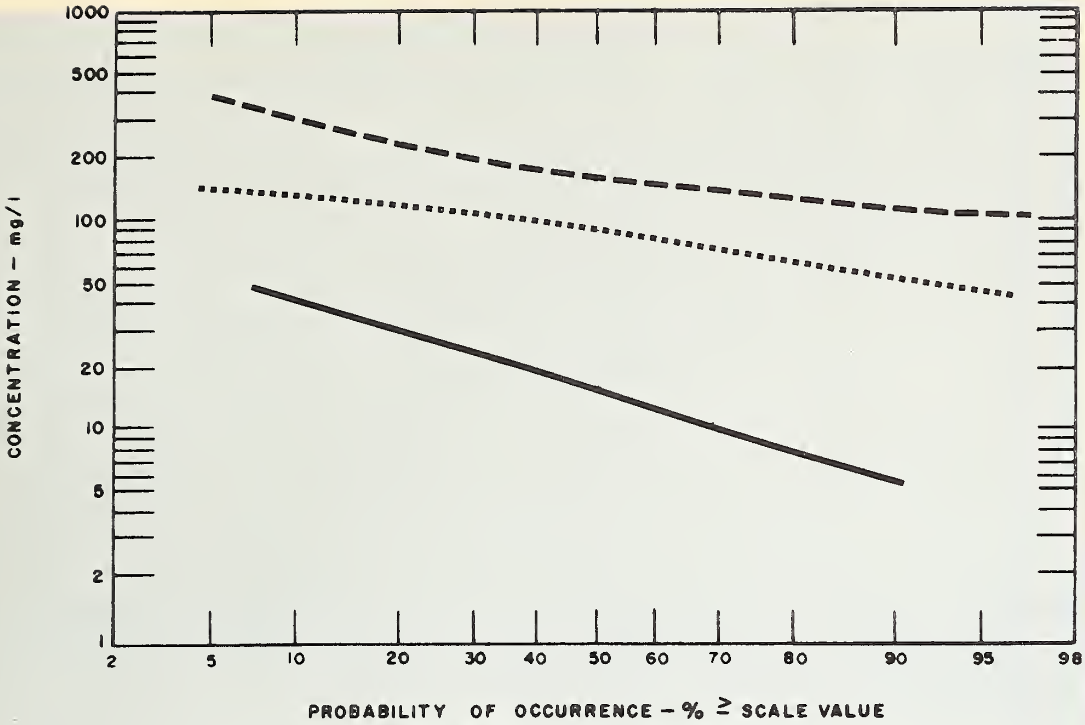
MONTH	TOTAL FLOW mil gal	AVERAGE DAILY FLOW mil gal	MAXIMUM DAILY FLOW mil gal	MINIMUM DAILY FLOW mil gal	CHLORINE USED 10^3 pounds	DOSAGE mg/l
JAN	61.1	1.97	2.5	1.7	3.3	5.4
FEB	58.9	2.10	2.3	2.0	3.2	5.4
MAR	79.7	2.57	2.9	2.2	3.8	4.8
APR	73.3	2.44	2.9	2.1	3.8	5.1
MAY	74.7	2.41	2.8	2.0	3.8	5.2
JUNE	65.1	2.17	2.5	1.9	3.6	5.5
JULY	66.0	2.13	2.6	1.8	3.7	5.6
AUG	62.8	2.02	2.5	1.7	3.6	5.8
SEPT	64.6	2.28	2.4	1.9	3.4	5.3
OCT	68.3	2.20	2.8	1.8	3.6	5.2
NOV	71.3	2.38	2.6	2.0	3.4	4.8
DEC	76.7	2.47	2.7	2.1	3.4	4.4
TOTAL	822.5	-	-	-	42.6	-
AVERAGE	-	2.25	-	-	3.6	5.2



BIOCHEMICAL OXYGEN DEMAND

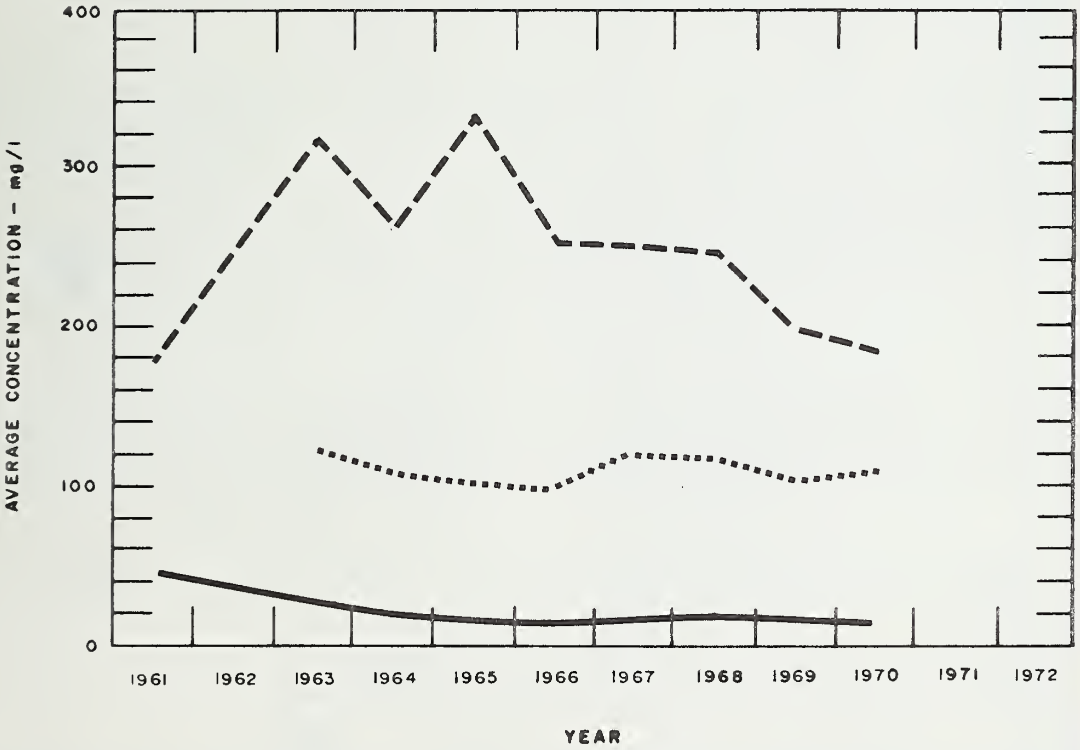
PLANT INFLUENT – – – PRIMARY EFFLUENT ······· PLANT EFFLUENT ———





SUSPENDED SOLIDS

PLANT INFLUENT ▬ ▬ ▬ PRIMARY EFFLUENT ······· PLANT EFFLUENT ━━━



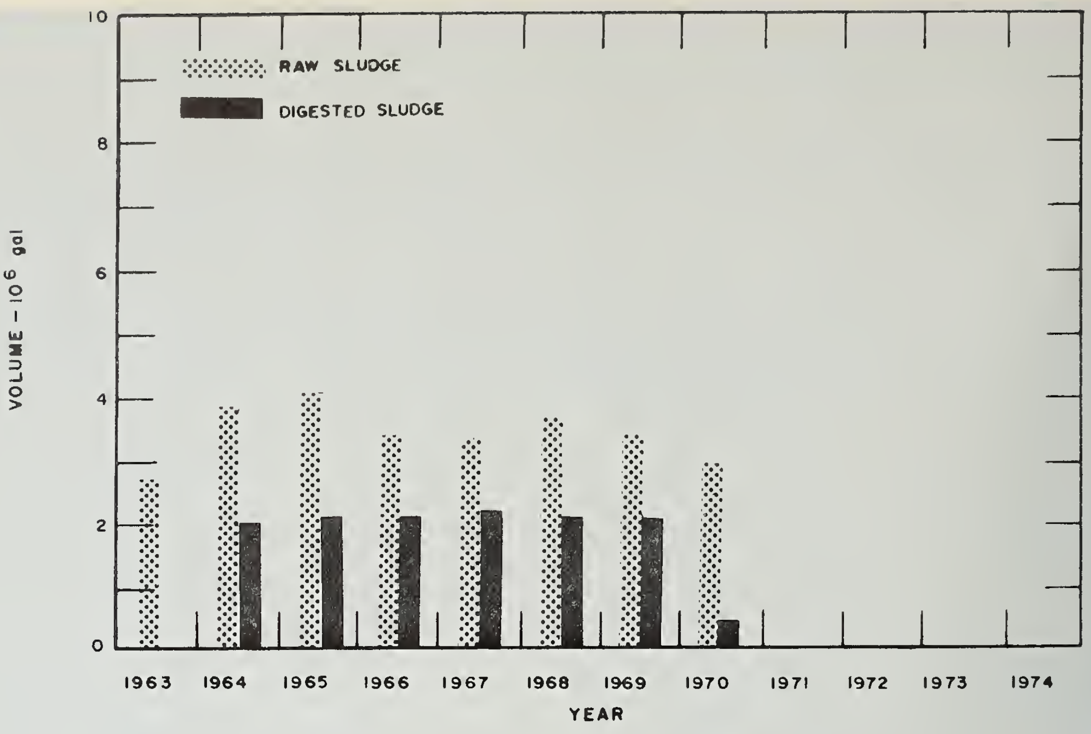
PLANT EFFICIENCY

MONTH	BIOCHEMICAL OXYGEN DEMAND						SUSPENDED SOLIDS						GRIT REMOVED
	INFLUENT		EFFLUENT		REDUCTION		INFLUENT		EFFLUENT		REDUCTION		
	n	mg/l	n	mg/l	%	10^5 pounds	n	mg/l	n	mg/l	%	10^5 pounds	cu ft
JAN	2	120	2	6	95	.7	2	120	2	18	85	.6	115
FEB	2	190	2	22	88	1.0	2	235	2	28	88	1.2	99
MAR	2	165	2	27	84	1.1	2	217	2	23	89	1.5	80
APR	3	93	3	18	81	.5	3	110	3	25	77	.6	60
MAY	2	122	2	17	86	.8	2	165	2	15	91	1.2	105
JUNE	2	195	2	9	95	1.2	2	245	2	10	96	1.5	104
JULY	2	140	2	7	95	.9	2	165	1	5	97	1.1	78
AUG	2	130	2	10	92	.7	2	178	2	20	92	1.0	101
SEPT	2	115	2	9	92	.7	2	165	2	8	95	1.0	91
OCT	2	140	2	11	92	.9	2	235	2	8	96	1.6	112
NOV	2	113	2	10	91	.7	2	125	2	10	92	.8	117
DEC	3	143	3	9	94	1.0	3	193	3	15	92	1.3	104
TOTAL	26	-	26	-	-	10.2	26	-	25	-	-	13.4	1166
AVERAGE	-	137	-	13	91	.9	-	177	-	16	91	1.1	97

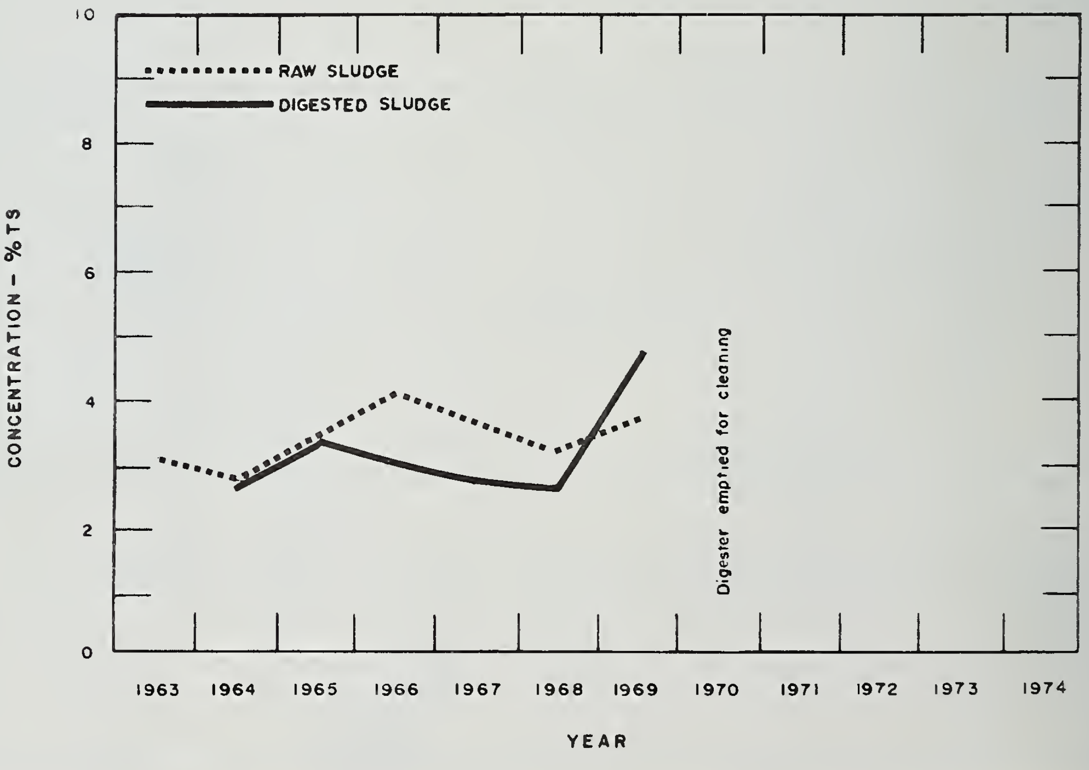
NOTE -- n is the number of samples taken

AERATION

MONTH	AVG DAILY FLOW mil gal	AERATION INF.		SECONDY. EFF.		M L S S CONCN mg/l	F/M lb B O D / lb MLSS	AIR USED 1000 cu ft / lb B O D	WASTE SLUDGE lb/DAY
		B O D mg/l	S S CONCN mg/l	B O D mg/l	S S CONCN mg/l				
JAN	2.0	105	107	21	13	1090	.40	2.0	-
FEB	2.1	120	120	52	30	1010	.52	2.2	-
MAR	2.6	102	87	23	10	1140	.47	1.4	-
APR	2.4	77	85	9	5	2860	.13	1.6	-
MAY	2.4	85	120	15	13	1310	.32	1.9	-
JUNE	2.2	135	87	14	20	1300	.46	1.2	-
JULY	2.1	78	95	10	18	1420	.25	2.1	-
AUG	2.0	77	78	12	8	1130	.29	2.6	-
SEPT	2.2	70	73	30	5	1270	.24	4.0	-
OCT	2.2	88	65	37	10	1420	.28	3.0	-
NOV	2.4	97	95	24	15	1160	.41	2.0	-
DEC	2.5	89	56	15	13	1270	.36	1.9	-
TOTAL	-	-	-	-	-	-	-	-	-
AVERAGE	2.2	94	89	22	13	1360	.34	2.2	-


RAW SLUDGE
DIGESTED SLUDGE
VOLUME – 10⁶ gal
0
2
4
6
8
10
1963
1964
1965
1966
1967
1968
1969
1970
1971
1972
1973
1974
YEAR

DIGESTION


RAW SLUDGE
DIGESTED SLUDGE
CONCENTRATION – % TS
0
2
4
6
8
10
Digester emptied for cleaning
1963
1964
1965
1966
1967
1968
1969
1970
1971
1972
1973
1974
YEAR

MONTH	DIGESTOR		HAULED
	RAW SLUDGE 10^3 GAL	DIGESTED SLUDGE 10^3 GAL	RAW SLUDGE YD^3
Jan.	50.7 **	14.1	1584
Feb.	*	-	1488
Mar.	*	-	1464
Apr.	*	-	1164
May	*	-	1080
June	*	-	1704
July	*	-	1476
Aug.	*	-	1728
Sept.	*	-	1382
Oct.	*	-	1416
Nov.	*	-	1056
Dec.	*	-	1488
Total	50.7	14.1	17030
Average	-	-	1419

** 1 week only

* Digester clean out. No record of sludge hauled from digester

Raw sludge from holding tank

Date Due

Water management in Ontario